



NASA Planet Finding Program



Zlatan Tsvetanov (NASA HQ)
TPF Program Scientist
February 15, 2005

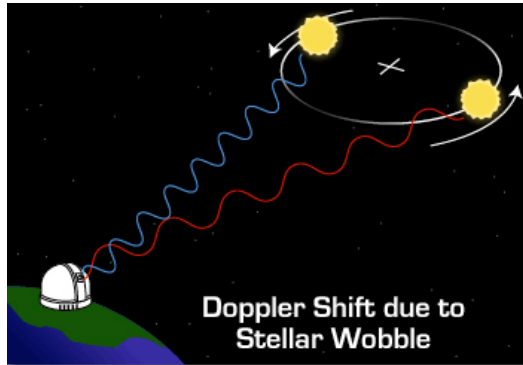


Extrasolar Planet Search - Goals & Projects

- Basic Goal - Search Life Outside the Solar System
 - Aim to find scientific answers to fundamental questions:
 - Are we alone? Where did we come from?
- Projects
 - Ground-based Interferometers:
 - Keck Interferometer (KI), and Outrigger Telescopes Project (OTP)
 - Large Binocular Telescope Interferometer (LBTI)
 - **Kepler Mission (Discovery class)**
 - Space Interferometry Mission (SIM)
 - Terrestrial Planet Finder (TPF)

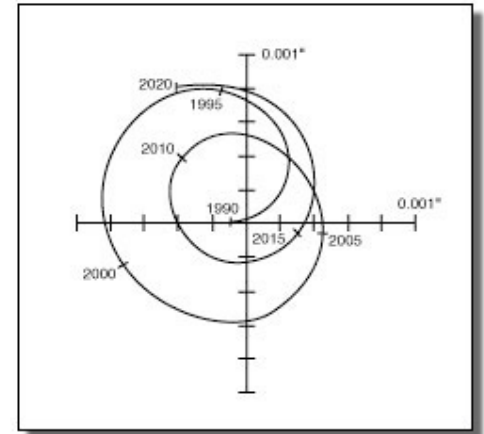


Four Indirect Planet Detection Methods

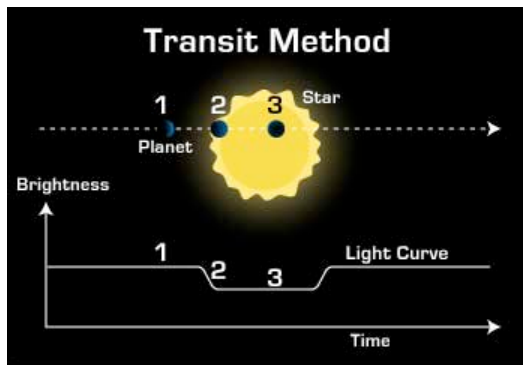


- Radial Velocities
- Astrometric

1995 onward
130+ planets
18 M_E min. mass

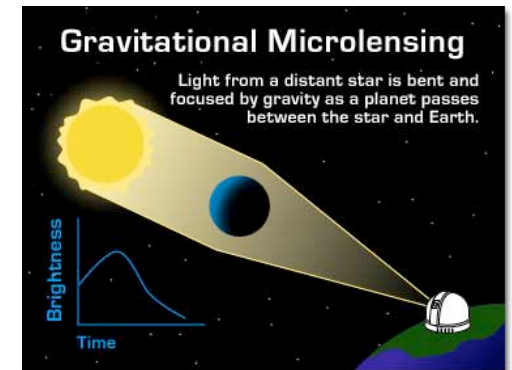


A few detected



- Transit
- Microlensing

A few observed
1% dip for R_J , 0.01% for R_E



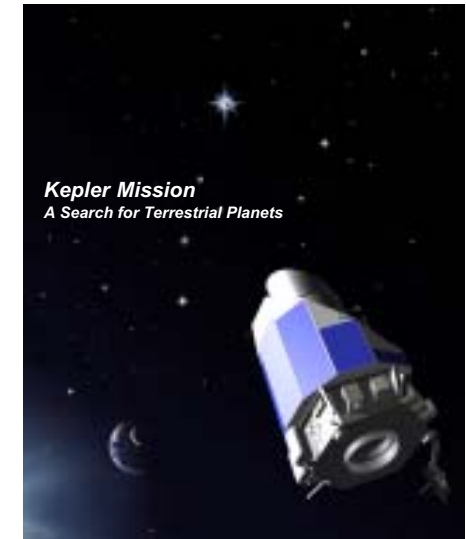
1 well established



Kepler - Project Overview

Salient Features

- *Habitable Zone Planet Finder (indirect, transits)*
- *Heliocentric Earth-Trailing Orbit*
- *Science Instrument: Photometer (0.95m aperture, 42 CCD's)*
- *Launch date: October 2007*
- *Launch Vehicle: Delta 2925-10L*
- *Operational life: 4 years*
- *Possible Extended Mission : Up to 2 Additional Years*



Science

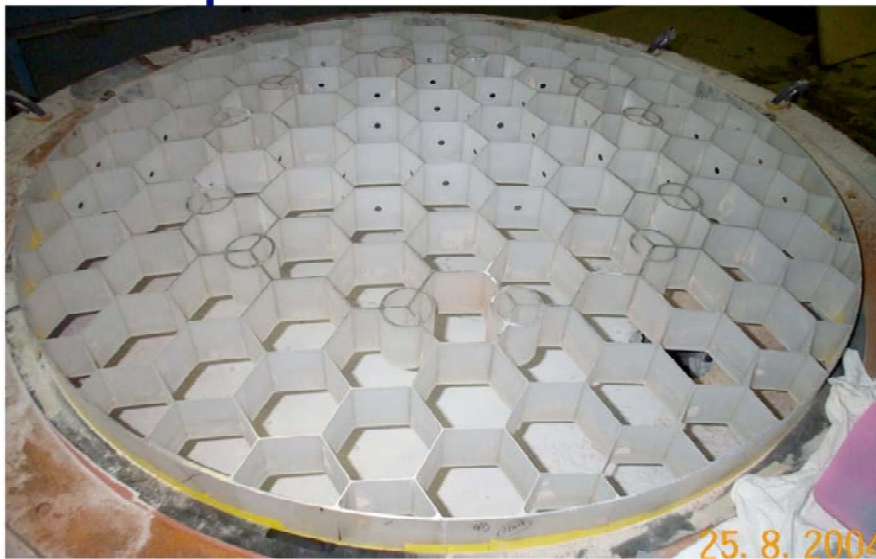
Explore the structure and diversity of planetary systems. Survey a large sample of stars to:

- *Determine the frequency of terrestrial and larger planets in or near the habitable zone of a wide variety of spectral types of stars;*
- *Determine the distributions of sizes and semi-major axes of these planets;*
- *Estimate the frequency and orbital distributions of planets in multiple-stellar systems;*
- *Determine the distributions of semi-major axis, albedo, size, mass and density of short-period giant planets;*
- *Identify additional members of each photometrically discovered planetary system using complementary techniques; and*
- *Determine the properties of those stars that harbor planetary systems.*

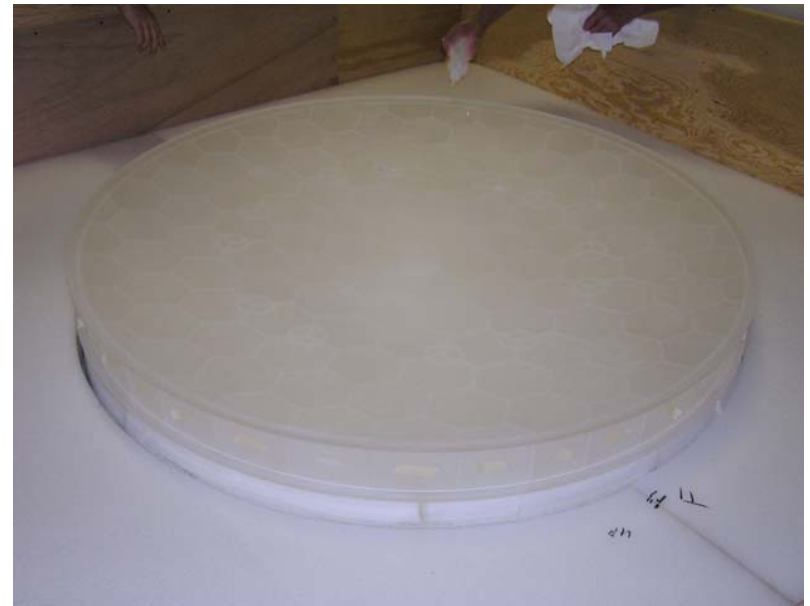


Kepler Optics Status

Lightweight Primary Mirror



PM Assembly w/ Facesheet



- Primary mirror is in polishing (@ Brashear)
- Schmidt corrector plate also in polishing (@ Brashear)



Kepler Detectors Status

- Detector Chip Assemblies (DCA) built from thinned wafers
 - Order for 50 flight units, fly 42 units
 - Produced in batches, built in groups of 4, with new group started every 10-14 days
 - Lead time for production and test of DCAs from thinned wafers is 7-8 weeks
- First Batch Used For Kepler Science CCD Design and Development
 - Deliverables: 4 Mechanical grade, 6 Evaluation grade, 3 Engineering grade (in-house)
- Current status:
 - 18 out of 50 DCA units have arrived at BATC
 - Next delivery due at BATC 7 Oct 2004



Kepler - Project Summary Status

- Project has successfully passed
 - ✓ PDR (Preliminary Design Review) - 12-54 Oct 2004
 - ✓ Confirmation Review - 2 Dec 2004
 - ✓ Officially transitioned to Phase C/D - 25 Jan 2005
- Detector Chip Assemblies are arriving approximately on schedule
- Kepler project has been directed to absorb a \$35M cut
 - Project is working on a solution